DSM1 Suisun Marsh Version Re-calibration

DWR Suisun Marsh Branch

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Background

In November 1996, the CALFED Bay-Delta Program asked DWR Suisun Marsh Planning to re-calibrate the DWR Delta Simulation Model Suisun Marsh Version model (DSM1) in response to concerns that the model is not adequately calibrated with flow data. The objective of this activity is to: (1) update model channel geometry descriptions based on a recently developed bathymetry database, and (2) improve the DSM1 flow calibration based on recent flow data collected by the USGS. This report summarizes the progress to date on each activity.

Updating DSM1 Geometry File

1. Objective Use the bathymetry data base and Viewer Program to check and update DSM1 grid network and channel descriptions.

2. Procedure Use the Bathymetry Viewer Program to check model channel length and representative cross-sectional area, top width, wetted perimeter, and side slope relative to the datum at zero MLLW at Golden Gate. The representative channel hydraulic depth (or rectangular section depth) is then calculated as cross-sectional area divided by top width. A procedure manual has been produced describing the geometry validation process. Figure 1 graphically shows the steps in the process.

Based on the bathymetry data, some short channels in the south Delta were consolidated, while other channels were sub-divided, particularly near the confluence of the Sacramento and San Joaquin Rivers and Carquinez Strait. All model open water areas (reservoirs) west of Frank's Tract and east of San Pablo Bay were replaced with nodes and channels. Suisun Marsh managed wetlands input data will be updated based on the updated grid network and the removal of open water areas in Suisun Bay.

3. Status The bathymetry and configuration of all channels have been reviewed and updated. QA/QC is complete of cross-section plots and channel data spreadsheets. The updated DSM1 Geometry file for rectangular channel sections (Version G9A) is assembled with the updated grid network, channel descriptions, and Suisun Marsh managed wetlands input data. The model grid map is updated to reflect the modified grid network. The updated DSM1 G9A Geometry file was tested for general stability with both 19-year mean and non-repeating Golden Gate tides and a range of Delta and

Marsh hydrologies. Geometry file statistics have been prepared for comparisons with the prior version of the DSM1 geometry file (Table 1). Overall changes in channel volumes are depicted graphically in Figure 2.

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The objectives of this activity are:

- Improve calibration of the DSM1 model using recently available flow data for Delta channels.
- Facilitate an open process of calibration evaluation through Internet access to calibration progress from the Interagency Ecological Program home page.

The procedure for accomplishing the objectives are as follows:

- Collect and prepare model input and field data
- Choose calibration time periods which represent a range of inflows, exports, and facilities operations.
- Develop data post-processing utilities and graphics for efficient analysis of calibration trials.
- Develop and maintain an Internet home page containing all calibration plots and meta data.

1. *Collection and Preparation of Model Input and Field Data:*

   The Suisun Marsh Branch maintains data for hourly Golden Gate tides, daily Delta Rim Hydrology, mean monthly Delta diversions and drainage estimates, Delta Cross Channel operations, representative daily Suisun Marsh managed wetlands diversions and drainage, daily precipitation estimates west of Collinsville, and monthly evaporation estimates west of Collinsville.

   Interagency Ecological Program File Server staff assisted with Clifton Court Gate operation times and Suisun Marsh Salinity Control Gate operation times.

   DWR Division of Planning staff assisted with south Delta barrier operation data.

   DWR O&M staff updated the Delta Island Consumptive Use data for water year 1993-94.

2. *Hydrodynamic and Salinity Module Calibration and Verification Periods:*

   Periods for hydrodynamics calibration were selected to maximize the use of existing velocity and flow measurements, particularly data from USGS UVM's for a range of Delta hydrologies and control structure operations, such as the Delta Cross Channel, Suisun Marsh Salinity Control Gates, and south Delta barriers. The calibration periods chosen are:

   - May 15-21, 1988

- January 12-20, 1993, and
- May 20 - June 1, 1994

The hydrodynamic verification periods are expected to include:

- June 1994
- October 1994
- April 1996

Salinity module calibration periods will be selected for a wide range of hydrologies and facilities configurations. We have tentatively chosen water years 1991 through 1993 (two critical and one wet water years). Salinity Module verification periods are expected to include water years 1987 through 1995.

3. *Procedures for Data Processing and Presentation*

DWR O&M staff prepared programs to quickly update model calibration coefficients between model runs. DWR O&M and Suisun Marsh Planning staff prepared programs to automatically reduce and graphically present model and observed data after each model run. For each calibration period, 72 combined plots (seven pages) of 15-minute stage and flow are generated of observed data and data from up to two model runs. Each calibration period also includes 45 scatter plots of model versus observed stage data along with regression statistics as a measure of goodness-of-fit.

4. *Internet Site for Sharing Calibration Progress*

All calibration progress is being shared through the Interagency Ecological Program home page (Figure 3). Maintenance of the home page is a joint effort of IEP File Server staff and DWR staff. On the IEP home page itself, there is a link called "CALFED DSM1 Re-calibration."

The IEP home page is located at **http://www.iep.water.ca.gov**

The web site includes time-series and scatter plots for three calibration periods of 10 to 14 days each. Each run includes a meta data file containing a description of that run, and what we hoped to achieve.

We encourage your perusal and comments. Comments can be made using an email reflector set up for calibration discussion. Through the web site and the email reflector, we are attempting to facilitate an open discussion on all issues related to this effort. **The reflector email address is "dsm1cal.water.ca.gov."**

Calibration Status

The hydrodynamic module calibration is underway. For the purposes of calibration, we are concentrating on adjusting friction coefficients in the model to match the phase and amplitude of model stage and flow to the observed data. The initial runs show general improvement of model fit to flow data which we attribute mainly to the improved channel geometry descriptions. Subsequent calibration runs thus far have attempted to better synchronize the tide between the Golden Gate and Suisun Bay/West Delta. Figure 4 is an example of calibration results comparing: (1) model flow predictions prior to re-calibration, (2) the interim flow calibration results, and (3) observed flow data from May 1988.

Figures 5A and 5B contains scatter plots of January 1993 predicted and observed stage with regression statistics and a 1:1 reference line. The model generally under-predicts the observed stage, though vertical control of field monitoring stations is questionable.

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